

**COELOPLANA SCABERIAE SP. NOV., A NEW BENTHIC CTENOPHORE  
(CTENOPHORA: PLATYCTENIDA: COELOPLANIDAE) FROM SOUTH AUSTRALIA**

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A new species of benthic ctenophore, *Coeloplana scaberiae* sp. nov., is described from South Australia, and some preliminary observations on the behaviour and abundance of this new species are presented. The new species can be distinguished from other species in the genus by its bright red or orange colour and its specific host plant, the brown alga *Scaberia agardhii* Greville. This is the fourth record of benthic ctenophores from Australia.

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Members of the Phylum Ctenophora have the potential to impact ecosystems to a considerable extent (Carlton & Geller 1993), yet research on this group has been relatively sparse because of the difficulties in collecting specimens. Within this phylum there are currently seven orders, one of which (Platyctenida) are benthic in habit. There are four families within this order and approximately 40 species. The platyctenes are unusual in that they are benthic, they have lost (secondarily) the characteristic ctene rows, and are capable of both sexual and asexual reproduction (Harbison & Madin 1982). Their ability to reproduce both sexually and asexually is unique among the ctenophore phylum and can often result in extremely high densities. A species of platyctene in Hawai'i reaches densities of over 3000 individuals/square meter (C. P. Galt, pers. comm.). Platyctenes range in distribution from tropical (Arnold 1993) to polar (Dayton & Robilliard 1972) waters, and can be found living on various hosts, including ascidians, hydroids, asteroids, cchinoids, and algae. Many species of platyctenes look similar to platyhelminths when preserved and may be found in collections labelled as such.

There are only three previous records of platyctenes from Australian waters (Stephenson *et al.* 1931, Smith & Plant 1976, Arnold 1993). Stephenson *et al.* (1931) describe the presence of *Coeloplana* sp. on the Great Barrier Reef but give no specific identification. Smith and Plant (1976)

describe specimens (Museum of Victoria, G2649) tentatively identified as *Coeloplana willeyi* collected from 15.5 m depth with green algae (*Caulerpa* sp) and unidentified red algae at the southern end of Port Phillip Bay, Victoria. Arnold (1993) collected specimens (Queensland Museum, G35888) of *Coeloplana meteoris* from Pioneer Bay, Orpheus Island from soft substrate at 12–13 m depth. W. M. Hamner collected specimens of planktonic transparent *Ctenoplana* off of Townsville but has not published these observations (pers. comm.).

Recently, some strikingly coloured animals living in association with the brown alga *Scaberia agardhii* Greville, 1830, previously thought to be platyhelminths, have been identified as an undescribed species of platyctene. This paper presents a description and some preliminary observations on the behaviour and abundance of this new species. This new species is confined to small populations on *Scaberia agardhii* in the shallow subtidal. As *Scaberia agardhii* is endemic to southern Australia we postulate that the new species of platyctene is also likely to be endemic to this region. Further work on this species and related species is in progress.

#### MATERIALS AND METHODS

The material reported here is deposited in the South Australian Museum, Adelaide (SAM), the

Australian Museum, Sydney (AM), the Museum of Victoria, Melbourne (MV), the Queensland Museum, Brisbane (QM), the Western Australian Museum, Perth (WAM), and the California Academy of Sciences, San Francisco (CAS). All material was fixed and preserved in 2% formaldehyde/propylene glycol solution in sea water, with the exception of one lot (SAM XH0010), which was fixed and preserved in 70% alcohol for later DNA extraction.

The ctenophores were first observed in the field using SCUBA equipment. Photographs were taken in the field with Nikonos III cameras with UW Nikkor 28 mm and UW Nikkor 35 mm lenses, Sea & Sea extension tubes, and Ikelite strobes, and in the laboratory with a Nikon F2 with a Nikkor 55 mm macro lens and strobes. Living specimens were collected by hand and transported back to the laboratory in aerated containers. Fragments of the host alga, *Scaberia agardhii*, were also collected and transported with the ectocommensal ctenophores intact. Colour transparencies (Photo index PH0141–4, PH0184) of the in situ specimens are held in the Photoindex collection of the Marine Invertebrates Section of SAM. Colour description of the new species follows Kornerup and Wanscher (1978).

Specimens used for examination under the scanning electron microscope (SEM) were dehydrated (in a sequential ethanol series) to 100% ethanol, critical point dried, and coated with gold. They were photographed using a Cambridge Mark III SEM.

#### SYSTEMATICS

##### Order Platyctenida Mortensen, 1912

###### *Diagnosis*

Body with a pair of conspicuous tentacles; body solid, greatly compressed in the oral/aboral axis, oral portion everted to form a creeping sole. Ctenes usually greatly reduced or absent in adults. Many species are ectocommensals.

##### Family COELOPLANIDAE Willey, 1896

###### *Diagnosis*

Creeping or sessile ctenophores, ctenes absent in adults. Tentacles, with tentilla, retractable into sheaths. Meridional canals branched and anastomosed. Pharynx permanently everted; statocyst present and aboral; body length < 6 cm.

##### Genus *Coeloplana* Kowalevsky, 1880

###### *Diagnosis*

With the features of the family.

###### *Remarks*

In addition to the new species described below, there are 22 other species of *Coeloplana* described between 1880 and 1970, some of which have been well documented (e.g. *C. willeyi*) and others of which are known only from fragments (e.g. *C. bannwarthi*). The majority of the described species are host-specific and have distinctive colours and patterns.

##### *Coeloplana scaberiae* sp. nov.

(Figs 1–3)

###### *Material Examined*

Holotype. SAM H843 (PH0143), found on the brown alga *Scaberia agardhii*, in 3–4 m depth, Edithburgh, Yorke Peninsula, Gulf St. Vincent, South Australia (35°5'S, 137°41'E), collected by K. L. Gowlett-Holmes 7 January 1994.

Paratypes. SAM H844 (PH0143) (19), AM G15606(2), MV F75050 (2), QM G305828 (2), CASIZ 104015(2), all same collection data as holotype; SAM H845 (PH0184) (2), same collection data as holotype except for date, 12 June 1994; SAM H846 (PH0141) (18), same collection data as holotype except for water depth, 4–5 m, and date, 3 January 1992; SAM H847 (PH0142) (15), WAM 3–95 (2), same collection data as holotype except for date, 18 May 1992; SAM H848 (PH0144) (85 + fragments), from on the brown alga *Scaberia agardhii*, in 3–4 m depth, Point Turton Jetty, Yorke Peninsula, Spencer Gulf, South Australia, collected by K. L. Gowlett-Holmes 2 April 1994.

Other material. SAM XH0010, same collection data as holotype, alcohol-fixed specimens.

###### *Description*

The following description is based on field and laboratory observations of both living and preserved specimens.

Platyctenes to at least 25 mm in length; solid dark orange or vivid red in colour without spots of any kind. Individuals have four rows of papillae extending from the aboral organ in a figure eight pattern, also papillae along the margin (Fig. 1A); papillae appear glandular (Fig. 2) and are capable of extending or retracting so that they are indistinguishable from the aboral surface,

particularly with preserved specimens. With two tentacles, both with tentilla (Fig. 1A); oral groove present (Fig. 1B). Temporary chimneys may be formed by a bending upwards of the oral groove, with the tentacle emerging from the center of the chimney. Embryos present along the margins of some specimens, both preserved and live. Meridional canal structure has not yet been

determined due to the opaque nature of the ctenophore body. Tentacular sheath morphology is highly variable ranging from anchor shaped (Fig. 1A) to  $\pm$  shaped. This extra cross piece in the tentacle sheath is similar to that found in *Vallicula* Rankin, 1956, but the tentacles have not been observed coiled within the cross piece (as in *Vallicula*).

#### Habitat

Found only on the brown alga *Scaberia agardhii* Greville, 1830, in colonies containing a single colour morph (red or orange) (Figs. 3, 4), usually on the tips of the plant. Very few *S. agardhii* are colonised, but when the ctenophores are present, they are abundant (from one to 50 per alga) and can be found on one or more branches, but rarely the whole plant. *C. scaberiae* is the first species of *Coeloplana* known to have an obligate association with a brown algal host.

#### Distribution

Central South Australia. Currently known only from the type localities, but has also been reported

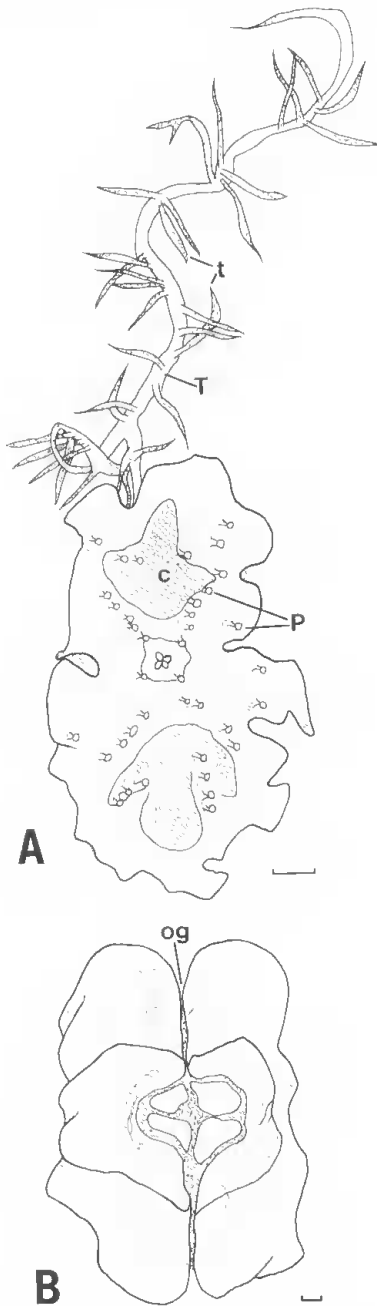


FIGURE 1. *Coeloplana scaberiae* sp. nov. Paratype SAM H844. Camera lucida sketches of aboral (A) and oral (B) surfaces. Note the presence of papillae (P) on the aboral side and the oral groove (og) on the oral side. The tentacles (T) have tentilla (t) that originate along one side of the tentacle. The tentacle sheath is large and has a cross bar (c) that can vary in shape and size. Scale bars = 1 mm.

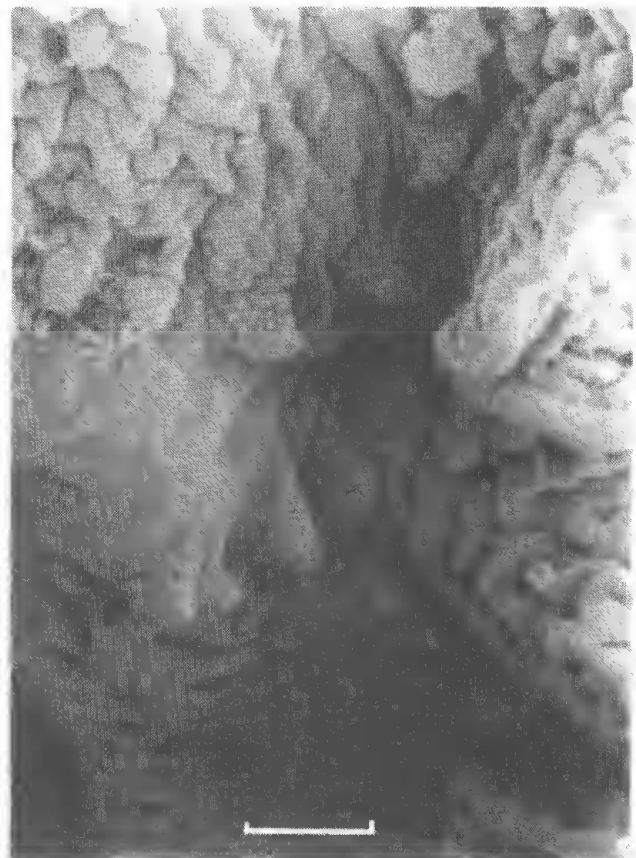


FIGURE 2. *Coeloplana scaberiae* sp. nov. SEM of the aboral surface showing the aboral papillae (P) and rugose structure of the aboral surface. This is characteristic of preserved specimens; live specimens often have a smooth surface when fully extended. Scale bar = 400  $\mu$ m.

from Victor Harbour, Encounter Bay, Fleurieu Peninsula, SA. Given the abundance of *Scaberia agardhii* in other areas of South Australia, further investigations should reveal the presence of *Coeloplana scaberiae* in these areas. *Scaberia agardhii* is endemic to southern Australia and it is likely that *C. scaberiae* is also endemic to this region.

#### Etymology

The species name *scaberiae* is derived from the generic name of its host alga *Scaberia*, in recognition of the specific association between the two species. Both names are based on the Latin *scaber* which is defined as rough, scabby, or mangy (Brown 1956), which describes both the ctenophore and its host alga.



FIGURE 3. *Coeloplana scaberiae* sp. nov. Paratypes SAM H846 (PH0141). In situ photograph showing ctenophores on the host alga *Scaberia agardhii*. There is a white sponge (s) that is always present and whose role in this commensal relationship is unknown. Scale bar = 0.5 cm.

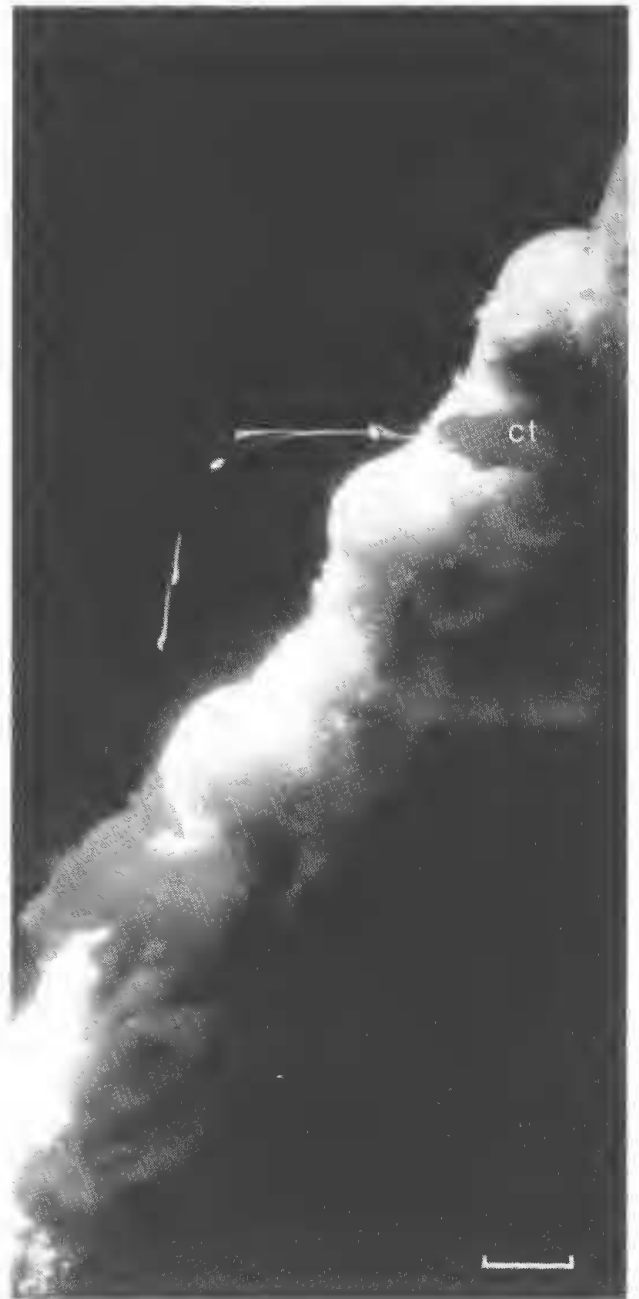


FIGURE 4. *Coeloplana scaberiae* sp. nov. In situ photograph showing ctenophore (ct) with tentacles extended in a typical fishing posture, on the host alga *Scaberia agardhii*. Scale bar = 0.5 cm.

*Behaviour*

The ctenophores feed at night and can be induced to feed in the laboratory in darkness. This suggests that there is not a circadian type of rhythm influencing the feeding bouts. White light in the form of a flashlight, strobe, or room light quickly causes these animals to withdraw their feeding tentacles and cease feeding despite a high food abundance. The animals will feed and can be observed under red light, and have been kept in the laboratory for three weeks without any noticeable deterioration. The host alga *Scaberia agardhii* however tends to die after three weeks and the ctenophores have been difficult to transplant to another substrate. The ctenophores require a high flow rate and are very susceptible to infection from ciliates. Specimens in the laboratory were fed enriched *Artemia salina* nauplii and did well until the host plant died. This high specificity suggests that the association is a very restricted one. An unidentified white sponge has always been observed under the ctenophore and it is possible that the sponge is providing a food source or is the host rather than *Scaberia*.

The mode of reproduction in this species is not clear yet, but embryos have been found under the margin on 18 of 22 preserved specimens. Other species in this genus are thought to have brood pouches in the aboral papillae (Harbison & Madin 1982). Dissections of aboral papillae showed no signs of embryos or use of papillae as brood chambers. The papillae are hollow within and open directly into the gastrovascular cavity. Embryos are found under the ventral margin of preserved ctenophores, particularly within the folds of the margin. It is possible that the embryos are brooded within the papillae and are released through the oral opening when the ctenophores are stressed (i.e. placed into preservative). In addition to the brooded embryos, the ctenophores were observed to reproduce by fragmentation in the laboratory. This mode of asexual reproduction is unique to this order.

## DISCUSSION

The host specificity of most of the *Coeloplana* species and the bright and distinctive colouration are useful taxonomic characteristics. Some of the earlier descriptions are lacking in detail or in specimens (*C. metschnikowii* or *C. bannwarthi*), and the classification of the group may require revision when further material of these is discovered. A key is provided below for all of the

known species in the genus. Descriptions are taken from the original literature except for *C. meteoris* (information from Arnold 1993).

KEY TO THE KNOWN SPECIES OF *COELOPLANA*.

- 1 – Host is an animal or plant ..... 2
  - Host unknown; or ctenophores found on sediment or in plankton ..... 22
- 2 – Host is algae or seagrass ..... 3
  - Host is an animal ..... 8
- 3 – Epiphytic on seagrass ..... 4
  - Epiphytic on algae ..... 6
- 4 – Epiphytic on *Zostera* ..... 5
  - Epiphytic on *Posidonia*, ctenophore colour deep olive green with sepia spots, tentacles yellow brown with a narrow yellow orange margin .....  
..... *Coeloplana perrieri* Dawydoff, 1930
- 5 – Ctenophore colour grey (dorsal) and white (ventral) (colour possibly a fixation artefact) .....  
..... *Coeloplana metschnikowii* Kowalevsky, 1880
  - Host association not specific (originally described from “red *Zostera*” – possibly host plant was misidentified). Ctenophore colour deep purple, red or orange fading to pink with white spots along the margin and yellow blotches at the base of papillae .....  
..... *Coeloplana willeyi* Abbott, 1907
- 6 – Obligate epiphyte on the brown alga *Scaberia agardhii* .....  
..... *Coeloplana scaberiae* sp. nov.
  - Epiphytic on algae other than *Scaberia agardhii* ..... 7
- 7 – Epiphytic on red algae (c.g. *Melobesia* sp.) or brown algae (c.g. *Sargassum*), ctenophore colour brown to brownish yellow or chocolate brown with yellow white cells around the margin and two bands of yellow around the statocyst; 10–20 aboral papillae each with 2–5 digitate processes .....  
..... *Coeloplana mitsukurii* Abbott, 1902
  - Host association not specific. Epiphytic on *Caulerpa*, red algae, coralline algae, *Sargassum*. Ctenophore colour deep purple, red or orange fading to pink with white spots along the margin and yellow blotches at the

- base of papillae .....  
 ..... *Coeloplana willeyi* Abbott, 1907
- 8 – Epizooic on echinoderm ..... 9  
 – Epizooic on cnidarian ..... 14
- 9 – Epizooic on echinoid ..... 10  
 – Epizooic on asteroid ..... 13
- 10 – Epizooic on *Diadema*, ctenophore colour solid dark purple matching host, known only from a fragmented specimen .....  
 .. *Coeloplana bannwarthi* Krumbach, 1933  
 – Epizooic on echinoid other than *Diadema*, ctenophore colour does not match host ... 11
- 11 – Epizooic on *Toxopneustes*, ctenophore colour yellow brown with a wide pale green margin .....  
 ..... *Coeloplana echincola* Tanaka, 1931  
 – Epizooic on echinoid other than *Toxopneustes*, ctenophore colour not as above ..... 12
- 12 – Epizooic on *Heterocentrotus mammillatus*, ctenophore colour brownish red, distinctive in lacking papillae .....  
 ..... *Coeloplana weilli* Dawydoff, 1938a  
 – Host association not specific. Epizooic on *Heterocentrotus mammillatus*, *Echinothrix diadema*. Ctenophore colour deep purple, red or orange fading to pink with white spots along the margin and yellow blotches at the base of papillae .....  
 ..... *Coeloplana willeyi* Abbott, 1907
- 13 – Epizooic on *Echinaster luzonicus* (Asteroidea), ctenophore colour mottled brownish red to brownish violet and white .  
 .... *Coeloplana astericola* Mortenson, 1927  
 – Epizooic on *Pentaceros hedemanii* (Oreasteriidae), ctenophore colour unknown; 6–20 papillae .....  
*Coeloplana krusadiensis* Devanesan & Varadarajan, 1942
- 14 – Epizooic on gorgonian or alcyonacean .... 15  
 – Epizooic on pennatulid *Pteroeides*, ctenophore colour intense orange or vermilion to orange; distinctive in lacking papillae .....  
 .... *Coeloplana dubosqui* Dawydoff, 1930
- 15 – Epizooic on gorgonian *Solenocaulon*, ctenophore colour brick red with white spots; oral groove present .....  
 ..... *Coeloplana sophiae* Dawydoff, 1938b
- Epizooic on alcyonacean ..... 16
- 16 – Epizooic on *Dendronephthys*, ctenophore colour dark vermilion, dark red, brick red, pink, orange, or grey stripes branching and anastomosing .....  
 ..... *Coeloplana bocki* Komai, 1920  
 – Not epizooic on *Dendronephthys* ..... 17
- 17 – Epizooic on *Cladiella* or *Alcyonium* ..... 18  
 – Epizooic on *Sarcophyta* ..... 20
- 18 – Epizooic on *Cladiella* or *Alcyonium*, ctenophore colour pink (in situ) or milky white (after preservation in formalin) with yellow tentacle bases and 4–5 pairs of papillae .....*Coeloplana komai* Utinomi, 1963  
 – Epizooic on *Alcyonium*, ctenophore colour and form not as above ..... 19
- 19 – Ctenophore colour is milky white with brown spots; 14 papillae in two distinct rows .....  
 ..... *Coeloplana gonoctena* Krempff, 1921  
 – Ctenophore colour clear, milky white, or violet brown; 6–16 papillae .....  
 ..... *Coeloplana agniae* Dawydoff, 1930
- 20 – Ctenophore colour unknown; 40 papillae ...  
 .... *Coeloplana wuennenbergi* Fricke, 1970  
 – Ctenophore colour unknown; more than 40 papillae ..... 21
- 21 – Ctenophore colour unknown; 70–100 papillae...*Coeloplana punctata* Fricke, 1970  
 – Ctenophore colour unknown; 60–70 papillae .....  
 ..... *Coeloplana lineolata* Fricke, 1970
- 22 – Habitat known ..... 23  
 – Host or habitat unknown, ctenophore colour unknown .....  
 ..... *Coeloplana indica* Devansan & Varadarajan, 1942
- 23 – Ctenophore planktonic ..... 24  
 – Ctenophore benthic in soft sediments; ctenophore colour clear with yellow white reticulations covering body and red pigmentation around canals, tentacle sheaths and papillae .....  
 ..... *Coeloplana meteoris* Thiel, 1968
- 24 – Ctenophore colour is perfectly transparent pale green, with 7–8 aboral papillae, 32 orange papillae arranged in 8 rows .....  
 ..... *Coeloplana mesnili* Dawydoff, 1938b

- Ctenophore colour transparent green; 8 papillae .....  
 ..... *Coeloplana tatersalli* Devansan & Varadarajan, 1942

From the above key and our observations, it is clear that the ctenophores discovered in South Australia are a distinct species. *C. scaberiae* is one of three *Coeloplana* species found on brown algae and it is the only obligate commensal species (*C. willeyi* and *C. mitsukurii* can be found on *Sargassum*, but are also found on other substrates). *C. scaberiae* possesses an oral groove as does *C. sophiae* but lacks the white spots found on *C. sophiae* and *C. willeyi*. The presence of an oral groove and an extra cross piece in the tentacle sheath are diagnostic characters for the genus *Vallicula*. The presence of a permanent chimney formed from the oral groove is characteristic of the genus *Lyrocteis* Komai, 1941. *C. scaberiae* has an oral groove, can form temporary chimneys, and may exhibit the cross pieces in the tentacular

sheath. These observations suggest that the designation of *Vallicula* and *Lyrocteis* in a separate family (Lyrocteidae) may need to be reconsidered. *C. scaberiae* is found with either red or orange colouration which is similar to the colouration of *C. willeyi*, but *C. willeyi* also has white spots along the margin and yellow spots at the base of the papillae that *C. scaberiae* lacks. Body colouration and host specificity clearly separate this new species from all of the described species. A molecular analysis of this group and the Phylum Ctenophora generally is in progress by one of the authors (GIM).

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